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ABSTRACT

This report presents the results of a survey of senior-level physics majors at U.S. colleges and universities who received a Bachelor's degree between September 1995 and August 1996. Completed questionnaires were received from 1,956 students. It was found that the number of undergraduates receiving Bachelor's degrees in physics continued to decline, falling two percent from the previous year. The drop at departments with physics graduate programs has been 2.5 times as great as at departments only offering an undergraduate degree in physics. The median starting salary for graduates with full-time potentially permanent positions was $31,000, while almost two-thirds of graduates entering directly into the job market indicated plans to pursue advanced study in the future. Though graduate study in physics remained a popular option for graduates to pursue, a growing fraction of these students chose to study in cross-disciplinary areas such as medical and health physics. Trend data on the number of degrees, degrees awarded by department, and postbaccalaureate plans are also reported. (MDM)

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AIP Pub No. R-211.28

June 1997

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1996 BACHELOR'S DEGREE RECIPIENTS REPORT

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HIGHLIGHTS

- The number of undergraduates receiving physics bachelor's degrees continued to decline in 1996, falling 2% from the previous year. Figures on junior-level enrollments indicate that these declines may continue for at least another two years.
- The decline in physics bachelor's degree production has not been uniform across department type. The drop at departments with physics graduate programs has been two and a half times as great as at departments only offering an undergraduate degree in physics.
- The median starting salary for 1996 physics bachelors with full-time potentially permanent positions was $31,000.
- Almost two-thirds of the physics bachelors entering directly into the job market indicated plans to pursue advanced study in the future, with one-third of them intending to enter a graduate physics program.
- Though graduate study in physics remains a popular postbaccalaureate option for physics bachelors to pursue, chosen by 33% of the respondents in the class of 1996, a growing fraction of these students are choosing to study in cross-disciplinary areas such as medical and health physics.
- One-third of the class of 1996 physics bachelor's degree recipients began their college studies majoring in another discipline.

In the past few years, many physics departments have experienced declining undergraduate enrollments. The number of physics bachelor's degrees conferred in 1996 (4173) has dropped 17% from the recent high in 1989. The physics community has not seen undergraduate degree production this low since the late 1950s.

At a time when many universities are evaluating programs within their system with an eye toward consolidating and eliminating, many physics departments are finding it difficult to justify their existence when compared with other departments with stable or growing enrollments. Some physics departments have initiated or strengthened their recruiting efforts at high schools, two-year colleges and other departments within their own university, hoping to entice additional students into physics.

The data in this report are based on responses to a survey sent to senior-level physics majors at

the end of the academic year. Completed questionnaires were received from 1,956 physics bachelor's recipients who earned their degrees between September 1995 and August 1996. This survey is part of an ongoing series that has been conducted by the American Institute of Physics (AIP) since the 1960s, documenting long-term trends in student characteristics and immediate postbaccalaureate plans.

The information in this report is supplemented with departmental data gathered in AIP's Enrollments and Degrees Survey. Single copies of the **Enrollments and Degrees Report**, which incorporates information at all degree levels, are available free from the Education and Employment Statistics Division.

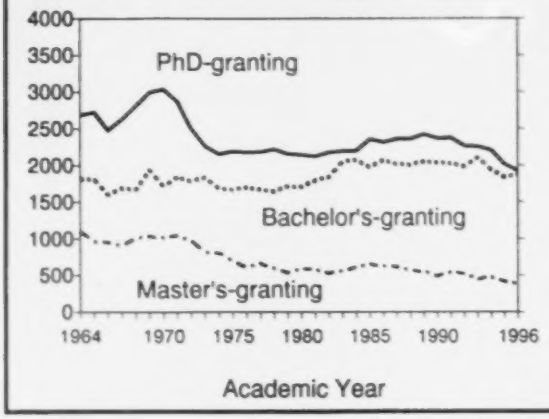
BACKGROUND

➤ Physics bachelor's degree production continues to fall (see **Figure 1**). The 2% drop in 1996 brings the undergraduate degree production to a level not seen for almost four decades.

➤ The recent decline in the number of bachelor's degrees produced has not been uniform across the different types of physics departments (see **Figure 2**). Similar to degree production patterns in the early 1970s, departments which also offer graduate-level physics degrees are experiencing the greatest declines. Since the recent high in 1989, the number of bachelor's degrees conferred at departments which offer a master's as their highest physics degree declined by 33% and at PhD-granting departments they have fallen by 21%, while at undergraduate-only departments they have fallen just 8%.

Figure 1. Physics bachelor's production in the US, 1955 to 1996.

Figure 2. Physics bachelor's degrees awarded by department type, 1964-1996.



➤ **Figure 2** also illustrates that the size of an undergraduate physics program is linked to the highest physics degree offered at a department. Of the 761 colleges and universities that offered a physics bachelor's degree in 1995-96, 183 or 24% also have a physics doctorate program. Though comparatively small in number, these PhD-granting departments produced almost half of the bachelor's degrees conferred in the class of 1996.

➤ Data on junior enrollments gathered at the university level indicate that net declines in physics bachelor's degree production may continue for at least another two years. This decrease will be especially concentrated in the departments that offer a physics graduate program.

➤ Only one-fifth of the graduating class of 1996 had not declared their major as physics by the end of their sophomore year. **Figure 3** illustrates the points at which this year's physics bachelor's degree recipients formally declared physics as their major.

➤ Of the physics bachelor's class of 1996, almost one-third had declared a major in another subject prior to choosing physics. Though students who changed their major to physics came from a wide range of disciplines, engineering was the single largest source (see **Table 1**).

Figure 3. Year of undergraduate study that physics bachelors formally declared physics as their major, class of 1996.

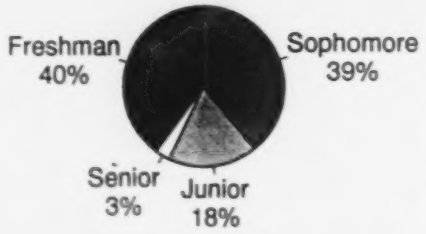


Table 1. Originally declared major of physics bachelors, class of 1996.

Physics	*69%*	
Other	*31%*	*%*
	Engineering	42
	Mathematics	11
	Other physical science	11
	Life science	6
	Computer science	5
	Other	25

➤ The likelihood of receiving a physics bachelor's degree is much greater if the individual has taken a physics course while in high school. Ninety-one percent of the physics bachelor's degree recipients in the class of 1996 indicated they had taken a high school physics course. This compares with approximately 24% of all the high school seniors four years earlier.

➤ The gender, citizenship and ethnic make up of undergraduate physics classes has remained relatively unchanged in recent years (see **Table 2**). The proportion of women among physics bachelor's degree recipients is similar regardless of whether a department offers graduate-level degrees or not.

Table 2. Demographic characteristics of new physics bachelors, class of 1996.

	%
Gender	
Male	82
Female	18
Citizenship	
US	92
Foreign	8
Race / Ethnicity	
White	86
Black	5
Asian	4
Hispanic	3
Other	2

➤ Two-thirds of all African-Americans who received physics bachelor's degrees in the class of 1996 earned them from the nation's thirty-three historically black colleges and universities that have degree-granting physics departments.

➤ Members of the physics bachelor's class of 1996 obtained double majors or minors in a wide variety of subjects. Mathematics was by far the most common (see **Table 3**), largely due to the overlapping math requirements needed for both majors.

Table 3. Educational characteristics of new physics bachelors, class of 1996.

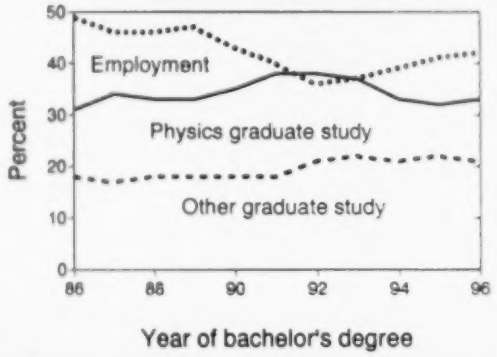
			%
Graduating with a double major	28%	Mathematics	42
		Engineering	12
		Computer sci.	4
		All others	42
Graduating with a minor	40%	Mathematics	50
		Engineering	4
		Computer sci.	6
		All others	40

➤ Thirty-nine percent of the degree recipients reported taking longer than four years to complete their physics degree, with the most frequently cited explanation being that they held some type of employment while pursuing their studies. Additional coursework resulting from a change of major or a double major was also a common reason. While this percentage may appear high, it is still well below the national average for all majors, which exceeds 50%.

POSTBACCALAUREATE PLANS

➤ A large fraction of physics bachelor's degree recipients continue to enter directly into the job market after receiving their degree. In 1996, 42% of the degree recipients chose to pursue employment, up from a recent low of 36% in 1992. A decade's worth of immediate post-degree plans are presented in **Figure 4** .

Figure 4. Postbaccalaureate plans of physics bachelors, 1986 to 1996.



Note: Each year 2-7% of the graduates had no postbaccalaureate plans at the time the survey was conducted.

➤ The majority, 56%, of the physics bachelor's degree recipients in the class of 1996 planned to enter graduate study immediately upon receiving their degree. Thirty-three percent chose to continue their studies in physics or astronomy and 21% planned to pursue other fields (see **Figure 4**).

Figure 5. Postbaccaulaureate plans of physics bachelors, class of 1996.

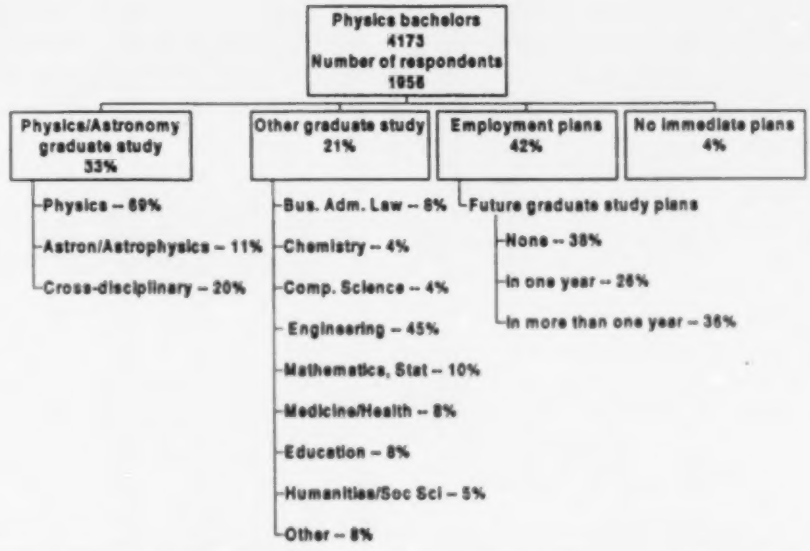
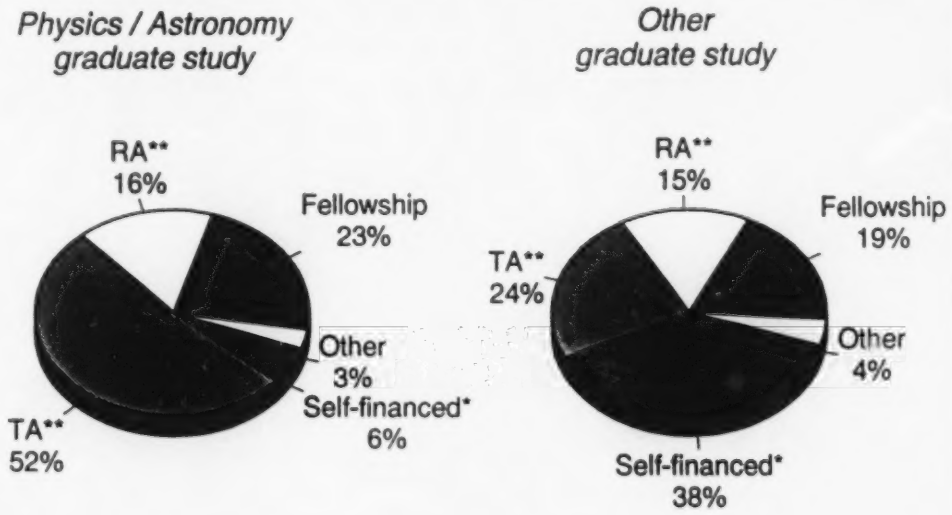


Figure 6. Primary sources of anticipated support for students planning to begin graduate study in the fall, class of 1996.



* Self-financed includes: funds from employment, family, savings and loans.
**RA stands for Research Assistantships; TA stands tor Teaching Assistantships.

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➤ Physics bachelors who earned their degrees from departments that also had physics graduate programs were much more likely to go on to graduate school in physics than were those who earned degrees from departments where the highest physics degree available was the bachelor's (39% and 26%, respectively).

➤ Although the proportion of recent degree recipients choosing to enter directly into physics graduate study upon receiving their physics bachelor's degree grew 1% over the previous year, the increase can be attributed to the rising number of students opting for cross-disciplinary studies such as medical and health physics (see **Figure 5**).

➤ Physics bachelor's degree recipients traditionally have pursued graduate study in a wide range of disciplines. For those choosing not to continue in physics, engineering remains by far the most popular field of study (see **Figure 5**).

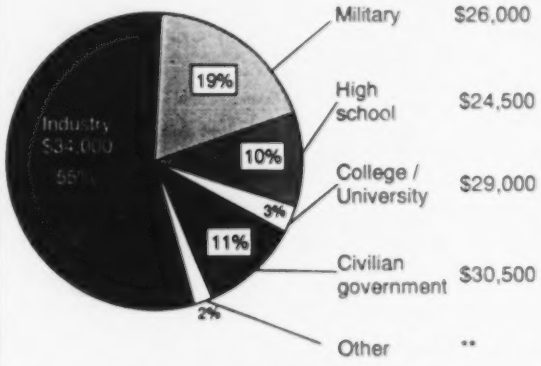
➤ Almost two-thirds of the degree recipients who planned to enter directly into the job market upon receiving their degree indicated an intention to pursue graduate study after a respite of a year or more. One third of these students plan to continue their studies in physics (see **Figure 5**).

➤ Physics bachelor's degree recipients going directly into physics graduate study continue to be relatively well-supported, with over half the students receiving a teaching assistantship (see **Figure 6**). Only 6% anticipate needing to support themselves with their own funds. The level of support for those switching to graduate study in other fields is less generous, leaving 38% to rely primarily on their own resources.

➤ As has been true in past years, industry remains the predominant employer for new physics bachelor's degree recipients who go directly into the job market. Industry also offers the graduates the highest salary levels. **Figure 7** illustrates the employer distribution for degree recipients holding full-time potentially permanent employment.

➤ A higher proportion of women among physics bachelor's degree recipients accept high school or civilian government positions, while men tend to choose the military and industry more frequently.

Figure 7. Employer distribution and median starting salaries for full-time employed physics bachelors, class of 1996.



* Note: Graph only includes degree recipients who indicated their positions were potentially permanent.

** Insufficient data

ASTRONOMY

➤ The 72 degree-granting astronomy departments in the US conferred 181 astronomy bachelor's degrees in the class of 1995-96. About half of these departments are administered in connection with a physics department. More than half offer graduate-level astronomy degrees as well as the bachelor's.

➤ The representation of women among the astronomy bachelor's degree recipients continues

to be greater than physics. Women made up 38% of the graduating seniors in the class of 1996, compared with only 18% for physics (see **Table 4**).

Table 4. Background and educational characteristics of astronomy bachelors, class of 1996.

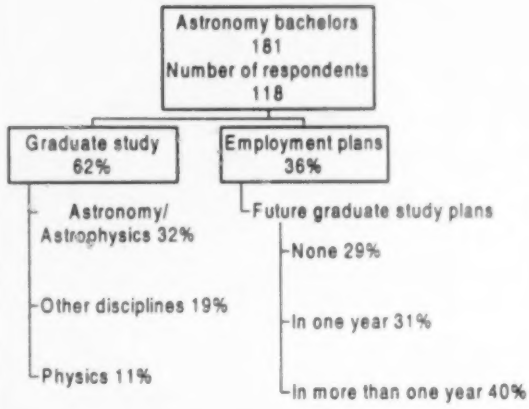
Characteristics	%
Gender	
Male	62
Female	38
Citizenship	
US	96
Foreign	4
Took HS Physics	
Yes	95
No	5
Graduating with a double major	
Yes	65
No	35
Graduating with a minor	
Yes	29
No	71

➤ Similar to the physics bachelors, the vast majority of astronomy degree recipients (95%) indicated that they took a high school physics course (see **Table 4**).

➤ Over two-thirds of the astronomy bachelor's recipients graduated with a double major, the majority in physics. Of the 29% of astronomy degree recipients who minored in another field, one-third minored in mathematics (see **Table 4**).

➤ As in past years and similar to the physics bachelors, astronomy bachelors have selected graduate study as their predominant postbaccalaureate choice, with 62% choosing this path in 1996. About half of these students are continuing their studies in the fields of astronomy or astrophysics (see **Figure 8**).

Figure 8. Postbaccalaureate plans of astronomy bachelors, class of 1996.



Note: Two percent of the Astronomy bachelors indicated they had no immediate plans at the time the survey was completed.

➤ Similar to what was noted earlier for physics, seventy-one percent of the astronomy degree recipients who chose to enter directly into the job market also indicated they intended to continue with graduate study in the future. Over half of these degree recipients who were planning to enter graduate study after a delay said they intended to continue in physics or astronomy (see **Figure 8**).

➤ Of the astronomy bachelor's degree recipients who entered or continued employment, 35% indicated their position was temporary or part-time. Industry employed the largest proportion of the new astronomy degree recipients, although many were in non-science related positions such as sales or other non-professional work.

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EDUCATION AND EMPLOYMENT STATISTICS DIVISION PUBLICATIONS

The Education and Employment Statistics Division collects data on the composition and dynamics of the scientific labor force and the education system. Below is a list of the Division's current publications along with a brief description of each. Unless otherwise indicated, single copies are available free of charge by writing to: American Institute of Physics, Education and Employment Statistics Division, One Physics Ellipse, College Park, MD 20740-3843, via email: stats@aip.org, or by calling (301) 209-3070. When applicable, all orders must be prepaid. Please make your checks payable to the American Institute of Physics.

Academic Workforce Report
A detailed analysis of faculty openings and new hires in universities and four-year colleges.

**Bachelor's Degree Recipients Report*
A summary of the characteristics and career goals of physics and astronomy bachelor's degree recipients.

**Enrollments and Degrees Report*
An examination of academic enrollments and degrees conferred in physics and astronomy programs nationwide.

***Graduate Student Report*
A summary of the characteristics and career goals of physics and astronomy graduate students.

**Initial Employment Report*
A description of the initial employment search and eventual employment of physics and astronomy degree recipients.

***National Laboratory Workforce Report*
A discussion of the physics workforce at the federally funded research and development centers, the second largest employer of PhD physicists engaged in physics.

Physicists in Government
An examination of the common career paths of Sigma Pi Sigma members with bachelors, masters and PhDs employed in FFR&DCs, federal agencies, state and local government and the active military.

****Physics in the High Schools III*
An analysis and interpretation of information collected in a nationwide survey of teachers of physics at the secondary level.

Realities of the Physics Job Market
A discussion of supply and demand issues in physics including historical employment trends and possible future changes.

**Roster of Astronomy Departments with Enrollment and Degree Data*
Detailed data for astronomy degree-granting departments in the U.S.

**Roster of Physics Departments with Enrollment and Degree Data*
Detailed data for physics degree-granting departments in the U.S.

***1996 Salaries: Society Membership Survey*
An analysis of the effect of factors such as geographic location, employment sector, gender, years from degree, and degree level on salary levels and salary increases. **$15** for a single copy, **$10** each for multiple copies.

***1996: Salaries Summary Report*
A two-page summary which gives overall trends and salaries.

Society Membership Profile: Rich Diversity and Common Concerns
A description of the employment and demographic characteristics of the membership of the 10 AIP member societies.

Underemployment Among Postdoctorates 1994: Society Membership Survey
The first report in a series on underemployment among society members with PhDs. This report examines indicators of underemployment among postdoctorates.

What Are Masters Doing?
An examination of the common career paths of Sigma Pi Sigma members who obtained their master's degrees.

* Published annually
** Published biennially
*** Published triennially